

## Case 3940

## Patent Claims

- 5 1. Method for producing radially perforated, cylindrical propellant tubes (1, 23, 31),  
characterized in that the respective propellant  
tube (1, 23, 31), when fixed and centred between  
its own open ends, is perforated in stages in a  
10 large number of consecutive perforation operations  
by means of one or more movable perforation pins  
(13) capable of being displaced radially in a pin  
die (10) relative to the propellant tube towards  
and at least as far as its main part through the  
15 wall of the same, which perforation pins are  
returned after every perforation to their position  
before perforation, in which position the pin die  
(10, 20-22) and the propellant tube (1, 23, 31) are  
subjected to relative displacement so that the  
20 pins, on the next occasion on which they are  
activated, perforate a previously unprocessed area  
of the propellant tube, and in conjunction with  
which the sum of all the perforations after the  
operation is complete gives an all-over  
25 perforation with the desired e-dimension between  
all the perforations.
2. Method in accordance with Claim 1, characterized  
in that the relative displacement of the pin die  
30 (10, 20-22) and the propellant tube (1, 23, 31)  
between two perforation stages axially, radially  
or both of these, is controlled in such a way that  
all the perforations, after the perforation  
operation has been completed in its entirety, will  
35 lie at a distance from one another equivalent to  
the desired e-dimension for the intended  
application of the propellant tube.

3. Method in accordance with Claims 1 or 2, **characterized** in that, between the perforation stages, the pin die is displaced in a linear fashion along the entire length of the propellant tube until such time as the whole of that length is covered by perforations, after which the propellant tube is rotated about its longitudinal axis through the angle that corresponds to the desired e-dimension, at the same time as which the longitudinal position of the pin die is corrected so that new, unprocessed material faces towards the pin die, and any additional perforations will then lie at an e-dimension distance from the previously executed perforations, after which this previously unprocessed part of the propellant tube is perforated in a corresponding fashion followed by a further rotation and longitudinal correction of the propellant tube until such time as it has been perforated in its entirety with the desired e-dimension distance.
4. Method in accordance with Claims 1 or 2, **characterized** in that the feed stage between the perforation stages affecting the propellant tube (1, 23, 31) and the pin die (10, 20-22, 24) is distributed by a rotation of the propellant tube and a lateral feed of the pin die that are selected in such a way that the perforation of the propellant tube will run in a spiral path around it from its one end to its other end, after which a new spiral path at a distance of one e-dimension from the first begins, until the whole of the propellant tube has been covered by perforations at distance of one e-dimension from one another.
5. Method in accordance with Claims 1 or 2, **characterized** in that the mutual relative feed of the pin die and the propellant tube is executed by a controlled rotation of the propellant tube until

- 19 -

one revolution has been covered by perforations, after which the pin die is fed for one e-dimension to permit the execution of the next perforation revolution.

- 5
6. Method in accordance with Claims 1-4, **characterized** in that a pin die with several pins arranged in a row after one another at an e-dimension distance from one another in the longitudinal direction of the propellant tube is used as the pin die, in conjunction with which the longitudinal feed of the pin die in the longitudinal direction of the propellant tube between each perforation stage is equivalent to the number of e-dimensions covered by the pins in the die.
- 10
- 15
7. Method in accordance with Claims 1-6, **characterized** in that the feed of the pin die and/or the rotation of the propellant tube is/are controlled by gauge blocks, against which fixed abutments come into contact.
- 20
8. Method in accordance with Claims 1-6, **characterized** in that the feed of the pin die and the rotation of the propellant tube are controlled by a microcomputer.
- 25
9. Arrangement for the execution of the method in accordance with one or other of Claims 1-8 for the perforation of propellant tubes (1, 23, 31) with the perforations distributed uniformly over the entire propellant tube at an e-dimension distance from one another adapted for the propellant having regard for its rate of combustion and its intended application, **characterized** in that, in the first place, this involves a fixing device (4-9) intended for the fixing and axial alignment of propellant tubes (1, 23, 31) preferably comprising
- 30
- 35

5 conical end guides (3, 4) capable of displacement relative to one another and capable of being introduced into the open ends of the respective propellant tube for centring the propellant tube and for clamping the propellant tube, and, in the second place, at least one pin (13) mounted in a pin die (10) and capable of displacement in the same to and from the outer surface of the respective propellant tube in its clamped position and through at least the major part of its wall, in conjunction with which the aforementioned pin die (10) and the respective propellant tube (1, 23, 31) are connected together in such a way as to permit movement, so that, after each and every one of the perforations of the wall of the propellant tube by the pins (13) and after the pins have been returned to the position before the perforation operation, the pin die and the propellant tube are displaced relative to one another so that new propellant material is exposed under the pin die for its next perforation stage.

10. Arrangement in accordance with Claim 9, **characterized** in that a plurality of pin dies arranged around the clamping position of the propellant tube are, at the same time, so arranged that they perforate the propellant tube with their pins arranged therein from mutually opposing directions.

11. Arrangement in accordance with Claims 9 or 10, **characterized** in that it comprises support rollers (17, 18), against which the clamped propellant tube makes contact in order to prevent downward deflection.

12. Arrangement in accordance with Claims 9-11, **characterized** in that an internal abutment (19), which does not obstruct the passage of the pins in

- 21 -

the pin die through the propellant tube, is arranged on the inside of the propellant tube.

- 5 13. Arrangement in accordance with Claim 12, **characterized** in that the internal abutment (19) is a tube so arranged as to hold the propellant tube horizontally.